

IMPROVED SEALING CAP IN PARTICULAR FOR A COLLECTOR TUBE
IN AN AIR-CONDITIONING UNIT FOR VEHICLES

The present invention refers to an improved sealing cap
5 in particular for a collector tube in an air-
conditioning unit for vehicles.

An air-conditioning unit for vehicles comprises,
amongst other things, a condenser, a drying means for
removing water particles from the cooling liquid and a
10 filtering element to hold impurities which may be
present in the cooling liquid.

As an alternative to the arrangement of a separate
dehydrating filter, arranged in the air-conditioning
unit between the condenser and the expansion valve, it
15 has become widespread to integrate a drying means and a
filtering element directly in a collector tube of the
condenser.

The condenser equipped with an integrated dehydrating
filter therefore has the task of removing water
20 particles from the cooling liquid, filtering impurities
which may be present in the cooling liquid and acting
as an accumulator for a determined amount of liquid.

The drying means and the filtering element, for example
contained in a rigid or semi-rigid casing of various
25 materials and of various types, must generally be
replaced after a certain operating time of the air-

conditioning unit. Alternatively, the drying means could be contained in permeable bags structurally separate from the filtering element. Also in this case it is suitable for the single components to be
5 replaceable by accessing the inside of the collector.

The collector tube is therefore equipped at one cylindrical end thereof with a removable cap to allow access to the inner components.

It is common to use threaded caps made from aluminium
10 or light alloy, as well as cylindrical caps equipped with at least one seat for the insertion of an O-ring which seals against the wall of the collector tube. This second type of cap is made either from alloy or from moulded plastic material.

15 The grooved cylindrical cap is moulded in a single piece through two symmetrical half-moulds. On the moulded cap, in the jointing zone between the two half-moulds, there are imperfections or moulding burrs, which also cover the work throats of the sealing rings.

20 In operating conditions, the cooling liquid inside the collector tube reaches very high pressure values. The cap is therefore heavily stressed and the imperfections present on the base of the seats of the sealing rings can cause harmful leaking of the cooling liquid out
25 from the collector tube.

Purpose of the present invention is that of realising

an improved sealing cap in particular for a collector tube in an air-conditioning unit for vehicles which avoids leaking of liquid even at high pressure.

Another purpose of the present invention is that of
5 realising an improved sealing cap in which the moulding imperfections in the jointing zone between the two half-moulds are not present at the work seats of the sealing rings.

Another purpose of the present invention is that of
10 realising an improved sealing cap in particular for a collector tube in an air-conditioning unit for vehicles that is particularly simple and functional, with low costs.

These purposes according to the present invention are
15 accomplished by realising an improved sealing cap as outlined in claim 1.

Further characteristics are foreseen in the dependent claims.

The characteristics and advantages of an improved
20 sealing cap in particular for a collector tube in an air-conditioning unit for vehicles according to the present invention shall become clearer from the following description, given as an example and not for limiting purposes, referring to the attached schematic
25 drawings, in which:

figure 1 is an exploded section view according to a

diametric plane of a first embodiment of an improved sealing cap in particular for a collector tube in an air-conditioning unit for vehicles, object of the present invention;

5 figure 2 is a top side view of the cap of figure 1 mounted and inserted in a cylindrical end of a collector tube shown only partially in section;

figure 3 is an exploded section view according to a diametric plane of a second embodiment of an improved
10 sealing cap according to the present invention;

figure 4 is a top side view of the cap of figure 3 mounted and inserted in a cylindrical end of a collector tube shown only partially in section;

figure 5 is an exploded section view according to a
15 diametric plane of a third embodiment of an improved sealing cap, object of the present invention;

figure 6 is a top side view of the cap of figure 5 mounted and inserted in a cylindrical end of a collector tube shown only partially in section;

20 figure 7 shows a further embodiment of an element that can be coupled with an improved sealing cap shown in the previous figures.

With reference to figures 1 and 2, a first embodiment of an improved sealing cap in particular for a
25 collector tube in an air-conditioning unit for vehicles is shown, wholly indicated with 10.

The cap 10, as shown in the exploded view, comprises two elements 12 and 13 moulded in plastic material able to be stably coupled together with interposition of an elastic sealing ring, an O-ring 14 housed in a seat 15.

5 A first element 12 is equipped with a portion 16 with the same diameter as a cylindrical end 11 of a collector tube, in which the cap 10 is inserted (figure 2), as well as an adjacent portion with a smaller diameter 17, suitable for receiving the second element
10 13 in a stable manner to define the seat 15 for the sealing ring 14.

In the first cap 10, shown as a non-limiting example, the second element 13 consists of a ring with the same diameter as the collector 11, snap-slotted onto a
15 recessed throat 18, which extends from the portion with a smaller diameter 17 to realise attachment means.

The seat 15 for the O-ring, realised by stably coupling together the two moulded elements 12 and 13, has a base with high surface finish defined by the portion with a
20 smaller diameter 17 of the first element 12, as well as sides respectively defined by a side surface 19 of the second element 13 and a side surface 20 of the portion 16 with the same diameter as the collector of the first element 12.

25 A second embodiment of an improved sealing cap 10' in particular for insertion in the cylindrical portion 11

of a collector tube of an air-conditioning unit for vehicles foresees the arrangement of two seats 15 and 150 to receive two elastic sealing rings 14, as shown in figures 3 and 4.

5 The constructive elements, substantially unvaried also in their operation with respect to that which has previously been outlined regarding the first embodiment, are identified by the same reference numerals and are not once again described here in
10 detail.

In the cap 10', the first moulded element 12 comprises a further portion with a smaller diameter 21 suitable for receiving a third moulded element 22 which can be stably coupled to define the seat 150 for the second
15 sealing ring 14.

Attachment means for the third element 22 extend from the further portion 21 with a smaller diameter which is arranged, with respect to the first portion with a smaller diameter 17, on the opposite side to the
20 portion 16 with the same diameter as the collector.

In the example shown, a tubular body 23, for example cylindrical, carrying two attachment teeth 24 on the outside for the engagement of complementary elements of the third moulded element 22 extends from the portion
25 with a smaller diameter 21 of the first element 12.

The third element 22 comprises an annular portion 25

with the same diameter as the collector and a hollow tubular portion 26, suitable for receiving the tubular part 23 of the first element 12.

The hollow tubular portion 26 is equipped with two
5 openings 27 in a position to match the attachment teeth 24, which constitute the matching elements for the snap engagement between the two pieces which can be stably coupled.

The second seat 150 for the sealing ring 14, realised
10 by stably coupling together the moulded elements 12 and 22, therefore has a base with high surface finish defined by the second portion with a smaller diameter 21 of the first element 12, as well as sides respectively defined by a side surface 28 of the third
15 element 22 and a side surface 29 of the portion 16 with the same diameter as the collector of the first element 12.

The moulded elements 12, 13 and 22 which can be coupled, which in the examples shown are stably coupled
20 through fixed attachment means, can also be electrowelded with ultrasound, since it is not necessary to foresee the possibility of disassembly of the assembled cap.

A third embodiment of an improved sealing cap 100,
25 according to the invention is shown in figures 5 and 6. The only difference with respect to that which has been

described regarding the cap 10' shown in figures 3 and 4 is represented by the third element 22, which is moulded integrally with a spacer shaft 30 that can be coupled with a filtering cartridge, not shown, suitable
5 for containing a drying means and a filtering element for the cooling liquid circulating in the collector tube.

In figure 7 a further embodiment of the third moulded element 22 able to be coupled is represented equipped
10 with an element 31 for the connection of accessories, for example consisting of a threaded hole. Accessories that can be connected to such a base can for example be a spacer shaft for a filtering and drying cartridge, a permeable bag suitable for containing a drying means,
15 or else directly a filtering and drying cartridge, not shown.

Indeed, the improved sealing cap, object of the present invention, can both be of the type separably or permanently connected for example to the cartridge, in
20 order to remove the cartridge, or other element to be replaced at the same time as the removal of the cap, and of the type singularly removable to access a drying means and to a filtering element contained in the collector tube.

25 As an example, in the figures caps 10, 10' and 100 are shown, in which the portions with a smaller diameter 17

and 21 which realise the base of the seats 15 and 150 for the O-rings are both realised on the first element 12, but at least one seat could also be realised on the second and/or third element, respectively.

5 In all of the embodiments described as an example the first element 12 is realised equipped with an inner recess 32 diametrically divided by a transversal wall 33, which protrudes at one end of the cap to form a gripper tab 34.

10 The moulded cap, object of the present invention, is therefore advantageously equipped with walls with a roughly constant thickness to avoid anomalous and uncontrolled shrinking phenomena of the material during cooling. Indeed, the increased dimensional precision
15 has a positive influence on the seal of the cap.

The improved sealing cap in particular for a collector tube in an air-conditioning unit for vehicles object of the present invention has the advantage of having work
20 seats for the sealing rings with a base with a high surface finish.

The base with a high surface finish is advantageously realised in the moulding step without the need to carry out subsequent finishing treatment.

Moreover, the elastic sealing rings are advantageously
25 positioned in their seats at the moment of coupling of the single elements constituting the cap. The O-rings

are not thus subjected to traction in the assembly step, an operation which could jeopardise the mechanical sealing characteristics thereof.

The improved sealing cap thus conceived is susceptible
5 to numerous modifications and variants, all covered by the invention; moreover, all of the details can be replaced by technically equivalent elements. In practice, the materials used, as well as the sizes, can be whatever according to the technical requirements.